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## Lab warms up to energy crisis

Conservation efforts help hold down consumption

By Mark Whalen

*Vaji Nasoordeen, manager of the Facilities Maintenance and Operations Section, says turning off chillers in 28 JPL buildings early in the day has helped significantly in the Lab's effort to conserve energy.*



Bob Brown / JPL Photo Lab

**T**HANKS TO CONSERVATION EFFORTS IN PLACE THROUGHOUT THE LABORATORY, JPL IS FARING RELATIVELY WELL DURING THE STATE'S CURRENT ENERGY CRISIS.

Electrical consumption, based on kilowatt-hours, has decreased steadily in the past few months. Between early November and the end of January, the Lab's consumption fell almost 1 million kilowatt-hours, or about 10 percent. "Our initial review indicates that we've reduced the demand measurably from our normal demand at this time of year," said Facilities Division Manager Bruce Fischer.

The energy savings, however, don't translate into dollar savings. Although electrical consumption at the Lab is at its lowest point in several winters, the cost of energy has risen considerably since the onset of the energy crisis. The Lab's bill for January to power provider Edison stood at about \$450,000, higher than at any time in the past three years.

In the current deregulated energy market, "There no such thing as cost savings, because we'll be paying a lot more this year—and probably next year—for the energy that we buy," Fischer said. "What we are looking for in our conservation efforts is avoiding even higher bills." Part of the reason for the price hike is a recent decision by the California Public Utilities Commission to raise costs by 1 cent per kilowatt-hour for the 90-day period that began on Jan. 6.

In the case of natural gas, prices have skyrocketed since last fall, most dramatically for the November–December period. The Lab paid about \$75,000 for gas in November, but more than \$170,000 for December. Still, JPL did its part by lowering consumption by 6.6 percent over that

time period.

"We have asked the Associate Director to create a substantial reserve in the Allocated Direct budget to cover our utility costs this year, because we feel the most critical time for energy costs is going to be over the next six months," Fischer said. "When fall comes, we feel there will be more stable rates."

So while the Lab can't control what it pays for energy, it can have a big say in how much energy it uses.

Vaji Nasoordeen, manager of the Facilities Maintenance and Operations Section, said in 28 buildings, chillers—air conditioning units that provide chilled water for building cooling—are being shut down early—about 3:30 p.m.—with minimal, if any, adverse impact to employees in those buildings. "We're also trying to identify buildings that can shut down chillers as early as 3 o'clock," he said.

An energy-saving measure under consideration for the summer months concerns alternate shifts for some workers in energy-intensive buildings—including 144, 150, 170, 248, 277 and 301. Instead of a traditional workday staff would work a swing or graveyard shift, saving energy usage during peak usage times, which are from noon to 6 p.m. in the summer. Electricity costs are dramatically higher in the summer due to the demand for air conditioning throughout Southern California.

Also helping the cause is that all JPL staff have been asked to turn off lights, computers and peripheral equipment when not in use. In addition, many office buildings have sensors that shut off lights automatically when motion is not detected in a particular area. "Facilities is looking to reprogram some special-projects money to install additional occupancy sensors before the summer," Fischer said.

The Lab is also enforcing the policy calling for heating at 68 degrees, cooling at 78 degrees. "By maintaining this, we can do a lot to manage the air conditioning demand," Fischer said.

In addition, JPL is looking into buying its power from different sources, but no decision has been made as yet.

For the last several years, JPL has purchased natural gas from the Defense Energy Support Center in Virginia, Fischer said. "They could also provide us with electricity; in fact, we looked at buying electricity from them a year ago, but there wasn't enough of a savings for us to justify leaving Edison as a supplier.

"We have put together a set of metrics to show our current consumption and demand, and compare those to previous periods to show the progress we've made. Employees can visit the Facilities Web page (<http://jpl-facilities/660/index.htm>) to access the data," Fischer said. "We will look at all alternatives to find a stable source of power for the Laboratory, for what we consider as reasonable a cost as we can get."

## Math model cracks the cause of Venus climate change

By Martha Heil

### S O L A R S Y S T E M

A mathematical model of the surface of Venus could show how the hot, dry surface has reacted to changes in temperature throughout the planet's history. Patterns of cracks were found on Venus' 500-degree surface by JPL's Magellan spacecraft in the early 1990s. Using an analysis technique by Pierre Moreels, a French intern at JPL, the patterns proved to be roughly hexagonal. This kind of cracking pattern shows that the surface has heated and cooled by almost 200 degrees Celsius (392 degrees Fahrenheit) over long periods of time.

Moreels adopted a modeling technique that was originally developed for medical imaging to discern individual blood cells, ensuring an accurate count. The technique is called the watershed transformation and has also been used in Earth-observing satellite images of fields.

"The program uses an analogy to the Earth's watershed process to filter out the noise from the radar imaging system on Magellan," Moreels said. "It finds the regions in the surface covered with patterns of multi-sided shapes. The more of these areas of multi-sided shapes we find, the better we can understand the history of climactic change on Venus."

Moreels and his mentor, Dr. Sue Smrekar, a research scientist in JPL's Geophysics and Planetary Geology section, reported their results March 12 at the Lunar and Planetary Science Conference in Houston.

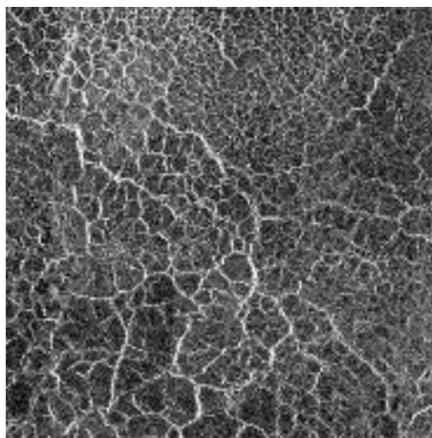
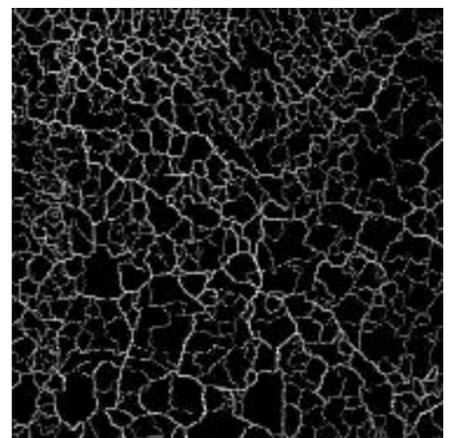


Photo at left is an actual image of Venus from the Magellan mission. The image at right is a mathematical model that filters out recurring radar noise by mapping the cracks into a graph simulating a field of mountains.



The Magellan spacecraft took pictures of large areas of fissures, analogous to cooling basalt fractures on Earth, but on a much larger scale. The mathematical program filters out recurring radar noise by mapping the cracks into a graph simulating a field of mountains—the rougher the surface, the higher the peak. The program fills in the valleys of the simulated landscape, much as rain fills in a lake. This way, small peaks of radar noise are covered over, and only the dramatic changes in the surface's roughness remain.

The program then evens out the edges and connects them. The result is a map of the surface cracks that can easily sort out the number and orientation of the cracks and the area between them. The shapes generally have six

sides of different lengths and cover an area more than 100 square kilometers (39 square miles).

Slow heating and cooling globally could have formed large areas of cracks on Venus' surface. A major episode of resurfacing occurred on Venus roughly 700 million years ago, in which water and sulfur levels in the atmosphere rose. Mapping the size and distribution of the cracks will help determine whether they are the result of local or global heating. Other models, in which volcanoes heat the surface or flows erupt on the surface and cool, have difficulties in explaining the size of these polygons.

More information on the Magellan mission is available online at <http://www.jpl.nasa.gov/magellan>.



Dr. Sue Smrekar and intern Pierre Moreels have shown how Venus' hot, dry surface has reacted to temperature changes.



# News Briefs

## Siegel elected IEEE Fellow

DR. PETER SIEGEL, supervisor of the Submillimeter-Wave Advanced Technology Group, Section 386, has been elected a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) for his contributions to the field of millimeter and submillimeter-wave radiometry, technology, and spaceborne instruments.

Siegel and his group are contributing to the Earth Observing System Microwave Limb Sounder, an instrument slated to be launched on the EOS Aura satellite in 2003; the Microwave Instrument for the Rosetta Orbiter, for a European Space Agency comet exploration mission; and the NASA heterodyne spectrometer instrument for ESA's Herschel/Planck astrophysics mission, which will be used for a variety of studies including studies of galactic structures and galactic life cycles.

Siegel joined JPL in 1987. The number of IEEE Fellows elected in a year is no more than one-tenth of 1 percent of the total IEEE voting membership of more than 10,000.

## Science Advisory Group seeks input

The Space and Earth Science Programs Directorate's (SESPD) Science Advisory Group, which provides advice to the directorate on research-related issues, advocates for JPL research and researchers, and compiles and distributes information of general interest to the research community, seeks comments or suggestions from the Lab's science community.

The group is chaired by Space Infrared Telescope Facility Project Scientist DR. MICHAEL WERNER. Among the group's achievements, he said, is the formulation of a policy recommending that JPL scientists have a substantial role in all small

missions managed by JPL, including Small Explorer (SMEX), Medium-Class Explorers (MIDEX), Discovery, and Earth Space Science Pathfinder (ESSP). This policy has been adopted by SESP.

The advisory group's meeting results are available online at <http://sespd-lib>. Go to "Work Area," then the SESP Science Advisory Group folder. Recent additions to the site—in the "What's New" folder—highlight programs that bring students and postdoctoral fellows to JPL, a white paper providing guidelines for the generation of press releases based on research results, and instructions for apply for SESP Bid and Proposal and JPL Technical Infrastructure Funds.

The group's folder includes a membership list. Input may be provided to the group through your division representative or directly to Werner.

The group's next meeting is scheduled for June 5.

## Signups underway for summer camp

Registration is now underway for the JPL/Caltech Child Educational Center's summer camp, "Exploring Our Natural World."

Offered for children from 5 through 12 years of age, the camp will be held from June 25 through Aug. 24 at three locations: the CEC site in La Cañada, next to La Cañada High School; Paradise Canyon Elementary School in La Cañada; and the CEC site in Pasadena, near Caltech.

Families may apply for the full summer or for weekly sessions; however, enrollment is limited at each location, so it is important to call early to ensure placement.

The camp will feature daily activities, long-term projects, field trips and science exploration.

For information, call the CEC at ext. 4-3418.

# Special Events Calendar

## Ongoing Support Groups

Alcoholics Anonymous—Meeting at 11:30 a.m. Mondays, Tuesdays, Thursdays (women only) and Fridays. Call Occupational Health Services at ext. 4-3319.

Codependents Anonymous—Meeting at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

End of Life Issues and Bereavement—Meets the second Monday of the month at noon in Building 111-117. Call the JPL Employee Assistance Program at 4-3680.

Gay, Lesbian and Bisexual Support Group—Meets the first and third Fridays of the month at noon in Building 111-117. Call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parent Support Group—Meets the third Thursday of the month at noon in Building 167-111. Call Greg Hickey at ext. 4-0776.

Senior Caregivers Support Group—Meets the the first Tuesday of the month in Building 167-111. For information, call the Employee Assistance Program at ext. 4-3680.

## Friday, March 16

Folk Music—Country-folk singer Katy Moffat will appear at 8 p.m. in Caltech's Dabney Lounge. Tickets are \$12 for adults, \$4 for children under 12. Call (626) 395-4652.

"Positioning Women For Intrapreneurship In Non-Traditional Roles"—Cristi Cristich, president and chief executive officer of Cristek Interconnects, a manufacturer of cutting-edge electronic connectors used in smart weapons, space applications and biomedical devices, will speak at noon in von Kármán Auditorium. Sponsored by the Director's Advisory Council for Women in celebration of Women's History Month.

Travel Film—*Slovenia and Croatia: From the Alps to the Sea* will be presented at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$9 and \$7. Call (626) 395-4652.

## Tuesday, March 20

JPL Hiking+ Club—Meeting at noon in Building 303-209.

Using Your Home Computer To Do JPL Work—Dr. Laif Swanson, manager of the ICIS Planning & Liaison Office, will discuss how to fill out your time-card, read and send e-mail, and access JPL information from home, including how to get a JPL remote access account, configure your home computer and get the software you need. Held at noon in von Kármán Auditorium. Web slides will be available from the "ICIS Noontime Talks & Events" link in the "News & Events" section of the ICIS home page at <http://icis.jpl.nasa.gov>.

## Wednesday, March 21

"To Test or Not to Test: The Comprehensive Test Ban Treaty"—Theoretical physics professor Dr. Sidney Drell will speak at 8 p.m. in Caltech's Beckman Auditorium. Free admission. For information, call (626) 395-4652.

## Thursday, March 22

Caltech Architectural Tour—The Caltech Women's Club presents this free service, which is open to the public. The tour begins at 11 a.m. and lasts about 1 1/2 hours. Meet at the Athenaeum front hall, 551 S. Hill St. Call Susan Lee at (626) 395-6327.

JPL Stories—Rosaly Lopes, research scientist and member of the Galileo Near Infrared Mapping Spectrometer team, will speak at 4 p.m. in the customer services area of the Library, Building 111-104. If you have questions about the JPL Story series, call Teresa Bailey at ext. 4-9233.

Von Kármán Lecture Series—Dr. Duane Bindschadler, Galileo's science planning and operations manager, will discuss the mission's latest results at 7 p.m. in von Kármán Auditorium. Open to the public.

## Friday, March 23

JPL 2001 Lecture Series—Dr. Ed Smith, senior research scientist in the Earth and Space Sciences Division, will discuss "The Heliosphere: Ulysses Observations at the Ongoing Solar Maximum" at 11 a.m. in von Kármán Auditorium.

Von Kármán Lecture Series—Dr. Duane Bindschadler, Galileo's science planning and operations manager, will discuss the mission's latest results at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

## Wednesday, March 28

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. Call Jim Raney at ext. 4-6301.

Women's History Month Luncheon—To be held at noon at Brookside Country Club in Pasadena. Author Dava Sobel (right) will discuss her best-selling book *Galileo's Daughter*, which chronicles the life of the astronomer by examining his relationship with his eldest daughter. Tickets are \$16; seats are limited. For more information, log on to <http://ood-lib.jpl.nasa.gov/ood-lib/dscgi/ds.py/Get/File-191/Women.doc>. Sponsored by the Director's Advisory Council for Women in celebration of Women's History Month.



## Thursday, March 29

JPL Golf Club—Meeting at noon in Building 306-302.

## Bonus awards

Recently, 25 JPL employees were named as Level A Bonus Award recipients. Level A recognizes Lab-wide accomplishments that impact JPL as a whole and achieve one of JPL's significant goals or objectives; enhance JPL's reputation; or advance a field of knowledge.

The \$3,500 awards were bestowed for accomplishments that occurred since October 1999. The three-tiered Bonus Award Program was designed to incent and reward accomplishments and behaviors that will ensure future success of the Laboratory: reward outstanding individuals who contribute to achieving JPL's goals and objectives; and increase JPL competitive advantage through strategic pay practices that differentiate high performance.

For more information on the program, log on to <http://eis.jpl.nasa.gov/hr/compensation/bonusawards.html>.

The Bonus Award winners for

## February:

- Section 197: Richard Roessler, Mary Wong.
- Section 212: James Prikosovits.
- Section 224: Stephen Canell.
- Section 260: Jean Walker.
- Section 264: Thomas May.
- Section 311: Henry Harris.
- Section 313: Guy Beutelschies, Curt Henry.
- Element 3231: Dr. Michael Werner.
- Section 334: Simon Yueh.
- Section 335: Richard Gross, Jeffrey Srinivasan.
- Section 341: W.K. Reinholdt.
- Section 346: Subbarao Surampudi.
- Section 351: Wilbur Marner.
- Section 352: Donald Moore.
- Section 353: James Polk.
- Section 383: Jeffrey Oseas.
- Section 440: James Graf.
- Section 450: William Irace.
- Section 506: Burton Sigal.
- Section 760: Thomas Livermore.
- Section 770: Said Kak.
- Section 775: Ronald Zenone.

The following employees received NOVAs in February:

- Section 314: Ning Liu, Ray Morris, Dennis Page, Carol Polansky, Sonserey Rubia, Steven Scott, Recaredo Torres, Vicken Voskanian, Randii Wessen.
- Section 368: Carol Scott.

## NOVA awards

The following employees received JPL's Notable Organizational Value Added (NOVA) awards in January:

- Section 330: Mae Hawk.
- Section 387: Henry Conley, Charles Davis, Arsham Dingizian, John Genofsky, Eric Hochberg, Gregory Lievense, Scott Nolte, David Randall, Lee Wigglesworth.

## Service awards

The following JPL employees were recently honored for 20 or more years of service:

- 40 years: Herbert Blackhall, Michael Carney, James Conel, Kathleen Myers.
- 35 years: Olen Adams, Ralph Bartera, Thomas Duxbury, William Kloezeman, M.L. MacMedan.
- 30 years: James Alexander, Margery Fea, Raymond Frauenholz, Donna Hoffman, Laura Hollis, William Irace, Gerhard Klose, Paul Koskela, Barry Levitt, Francis Mathur, Sharon Pasos, Elena Pestano, David Quinn, Moktar Salama.
- 25 years: Sandra Bedrossian, Richard Benson, Jeffery Cornish,

Michael Girard, Charles Greenhall, Ming-Taun Leu, Eleanor Manning, Merle McKenzie, Ronald Schlaifer, Joseph Toczylowski, Donald Yeomans.

- 20 years: James Border, Margaret Borzage, Robert Brooks, Lamont Burgess, Kumar Chandra, Stephen Dawson, David Diner, Richard Doyle, Mark Gatti, Susan Gilbert-Hagood, Johanna Gunn, Charles Keith, Gail Klein, Jack Mallory, Jacob Matijevic, Iain McDermid, Ronald Morillo, Patrick Murphy, David Nichols, Hope Norton, Hassan K.P. Shankar, Alfred Pappano, Thomas Runge, Jennifer Schlickbernd, Linda Scott, Roy Scrivner, George Shultz, Steven Wells.

## Antarctica *continued from page 3*

changing. By measuring the extent and velocity of the moving ice and estimating its thickness, we can estimate how much ice may be lost into the ocean from Earth's largest storehouse of freshwater. "These calculations are important for understanding Antarctica's contribution to the present rate of sea-level rise of about two millimeters, or the thickness of a dime, a year."

Mission scientists are now developing velocity maps showing the direction and speed of the ice. They have already created the first-ever complete velocity maps of the spectacular Lambert Glacier, a sinuous ice stream more than 500 kilometers (311 miles) long, which reaches speeds of more than one kilometer (about two-thirds mile) a year once the ice spreads onto the Amery Ice Shelf.

They are also beginning to create a new map of Antarctica to compare with the one made in 1997. The process of turning the radar images into map-quality mosaics will take about a year to complete.



# BREAKING the ICE

*Eight hundred kilometers from the south pole, where the summer temperatures dipped to minus 25 Celsius*

*By Gia Scafidi*

*and the Sun beamed 24 hours a day, JPL's Dr. Alberto Behar and his field colleagues captured the first-ever still and video images deep within Antarctic ice streams.*

**T**HE ANTARCTIC ICE BOREHOLE PROBE MISSION, a collaborative effort of JPL and Caltech, supported by NASA and the National Science Foundation, looked at the dynamics and stability of the West Antarctic ice sheet and served as a stepping stone in the development of technology capable of withstanding extreme ice and liquid environments.

The Antarctic ice sheet, the size of the United States and Mexico combined, holds a potential gold mine of information related to the geological history of Antarctica and the mechanisms by which ice flows from this area to the oceans. Studies show that significant changes in glacier melting and flow rates could considerably impact sea levels and global warming.

"One way to study the dynamics of the West Antarctic ice sheet is to study the fast-moving ice streams and understand their dynamics," explained Behar, JPL's chief engineer on the glaciological investigation. "What sets their speeds, causes them to flow, makes them stop? It's not very well understood yet." He explained that ice streams are essentially like glaciers within the ice sheet.

The three-month investigation took place at Ice Stream C, an area where 150 years ago the ice suddenly stopped flowing, and attention has been drawn to one area in the middle of the stream. This "sticky spot," moving at a rate of 0.02 centimeters (0.008 inches) per day, greatly differs from its neighboring streams, which flow at approximately one meter per day.

Sharing three eight-hour shifts every day, the 11 researchers utilized the ice probe, equipped with lights and two cameras. By way of hot-water jet drilling and reaming, the team made 17-centimeter-wide (6.7-inch) holes in the ice, each hole taking approximately 36 to 48 hours to make. The probe was then lowered more than 1,200 meters (3,900 feet) deep into the water-filled holes via a fiber-optic cable. The team had to finish measurement sequences within four to five hours or the middle of the deep hole would refreeze to a diameter smaller than the probe, causing great problems retrieving the instruments.

By means of snowmobiles, the science team members traveled between their campsite and four different drill sites. They found that the further south they drilled the faster the stream flowed.

"The investigation was a drama unto itself," said Behar. "We were exploring areas never seen before and finding things out never before known in a place that keeps its secrets very tightly."

Over the course of the investigation, the researchers observed what appeared to be a basal water system, or series of water channels under the ice sheet. It's believed that these channels aid in the flow of ice streams. The team calculated that, if these channels existed, the depth of the water basal cavity would be in the millimeter range. On the contrary, at the third drill site, the probe plunged through an "astounding" 1.4 meters (4.6 feet) of water at

the base of the stream.

To the researchers' surprise, the study also revealed debris embedded in the ice much higher from the base of the ice stream than expected. Researchers thought they'd find debris no higher than two meters (six feet) off the base. In fact, the visual data showed debris at 26 meters (85 feet) off the base, which Behar said could not yet be explained. The probe's visual images also uncovered a layering effect in the ice, thought to be previously melted and frozen horizons.

"The layered information will turn out to be very interesting," said Dr. Frank Carsey, JPL's principal investigator on the project. "These layers could serve as a calendar or a unit of deformation." Ice sheets move slower than ice streams, explained Carsey, the top moving somewhat faster than the bottom.

All of the team's findings open up the doors to further glaciological research. "As Hermann Engelhardt [Caltech's principal investigator on the project] put it 'With the probe, we've now left the dark ages,'" said Behar.

"This project fits into the bigger picture of planetary ice studies," noted Carsey. "It provides us with some understanding of what goes on deep in ice caps—Earth's ice caps, Martian ice caps and ice caps on Jupiter's moon Europa."

"If we are going to spend \$500 million on a space mission to the Mars polar cap or to Europa, we really have to be as certain as possible that the hardware and system will work as planned," said Dr. Arthur Lane, JPL's co-investigator on the project. "These glaciological environments provide us with most of that stressful envelope that allows us to be far more certain we can make the system work properly."

JPL hopes to advance the probe's technology in the next year or two, adding sensors capable of detecting biology in the Antarctic ice sheet, and eventually on other planets. It's known that microbes live under glaciers, where it's warmer and there are nutrients from impurities found between water crystals.

"These locations are very old places, some are hundreds of millions of years old," said Carsey. "The base of an ice sheet in a planetary program is a matter of history and biology."

Until the next challenge, Behar is grateful to have been part of such a successful team effort. "It has been an incredible experience, considering the number of people it takes to pull off one of these projects," he said. "It was challenging, but it was also a great feeling to see a project bear fruit in the field. To see different projects come together and bring back eye-opening data was wonderful."



*Above left: Dr. Alberto Behar operates Caltech's hot water drill set. The equipment and tent in background are set on sleds and can be moved to different locations by tractor or snowmobile.*

*Above: A drill hose being deployed into a freshly drilled bore hole.*

## JPL studies show Antarctica isn't sitting still

*By Rosemary Sullivant*

Antarctica may appear to be a land frozen in time, but it certainly is not still. Glaciers plow down the continent's center to the sea, icebergs snap off and crash into the ocean, and great rivers of ice snake through the ice sheet, evidence of a dynamic relationship between this remote continent and global climate.

A joint NASA and Canadian Space Agency mission now provides a more comprehensive view of how the Antarctic ice sheet moves and changes, and may help answer some fundamental questions about this mysterious place at the end of the world, including whether the ice sheet is advancing or retreating.

The initial mapping campaign, the 1997 Antarctic Mapping Mission, resulted in the first high-resolution radar satellite map of the continent. The second phase, the Modified Antarctic Mapping Mission, completed last November, once again charted Antarctica with space-based imaging radar. This second mission

gives scientists a way to see how the continent has changed over the past three years as well as a wealth of new information on the movement of the most active region, the outer half of the ice sheet.

For the new mission, the Canadian Space Agency's RADARSAT-1 satellite trained its imaging radar on the outer half of the continent twice during each of three consecutive 24-day periods, ending last Nov. 14.

Precise navigation and data from the six passes make it possible to create detailed topographic maps and to measure the speed of the moving glaciers. "Most of the Antarctic ice sheet moves imperceptibly slowly but nevertheless surely," said science team member Dr. Frank Carsey of JPL. "This mission gives us an overall snapshot of how the ice moves and how it is

*continued on page 2*

# Ocean Envoys take education online

By Gabrielle Birchak-Birkman

Classrooms have now become larger thanks to the Internet. JPL is providing online workshops for educators involved in the Ocean Envoys Program. With a click and scroll, interested participants can meet, visit seminars like they would at a conference and have a one-on-one conversation with keynote speakers.

The Ocean Envoys Program consists of volunteer educators who give presentations on JPL oceanography to classrooms, museums, national parks, Girl Scouts, Boy Scouts, service organizations, ham radio operators and other groups. The three-part educational program started in February. JPL and its partner in the venture, College of Exploration, will present the two following series in April and August. "These volunteers really help spread

the word about the cool things that NASA and JPL are doing, said Tom Nolan, who works in educational outreach for the TOPEX/Poseidon Project.

College of Exploration is a nonprofit educational organization that designs courses for students of all ages with different kinds of computer capabilities.

College of Exploration's program is global and addresses people from several different countries. That way people can participate when it is convenient for them. It's customer driven," said Nolan.

Peter Tuddenham, the college's executive director, explained that the virtual campus is not just a message board where academia and students meet. "We like to focus on community building," he said. "Learning comes from good

conversation and sharing. We are always looking for new ways to transcend learning barriers. We can make an environment where people feel like they belong."

JPL also worked with College of Exploration on the Project Ocean Steward Online Expedition and Teacher Workshop. National Geographic conducted the project with support from JPL and the National Oceanic and Atmospheric Administration Sea Grant program.

"This is the most convenient online conference program I have used," said Nolan. "I would like to invite the rest of the Lab to try College of Exploration for their outreach and training activities."

Those interested in taking part in the Ocean Envoys online workshop can contact Annie Richardson at JPL via e-mail.



## Letters

I would like to express my warmest thanks to my friends and co-workers for your sympathy and support at the passing of my grandmother. Also, thanks to ERC for the very beautiful plant.

Dee Darrow

We would like to thank our JPL friends for their support and kind thoughts following the sudden passing of Pete's dad. It has meant so much to know friends and family are standing right behind our shoulders, ensuring our ability to move forward. Thanks also to the ERC for sending a lovely potted plant to remind us of his life and love.

Pam and Pete Distaso

I would like to thank everyone at JPL and Acro who supported and prayed and gave a hug during the illness of my father, Benny De La O. Our family greatly appreciated your donations, helping us where needed at the time of his death. Thank you also to the ERC for the beautiful plant sent in his memory.

Roberta Davis and family

I would like to thank my friends and colleagues for their compassion and support over the death of my father, Samuel Laidig. My family and I especially thank both the ICIS and 501 organizations for their donations to the Pasadena Sister Cities Student Exchange Scholarship Fund and the University of California, Berkeley Alumni Scholarship Fund in his honor. Your generosity is deeply appreciated and your kindness a great comfort. Thanks also to the ERC for the beautiful spathiphyllum.

Vicki Laidig

## Retirees

The following employees retired in March:

Nathan Burow, 39 years, Section 330; Theodore Moyer, 38 years, Section 312; Jurrie van der Woude, 37 years, Section 181; Richard Messer-Smith, 34 years, Section 341; Kerry Nock, 31 years, Section 380; Robert Galletly, 18 years, Section 352.

## Classifieds

### For Sale

AIR CONDITIONER, Kenmore, window mounted, cools liv. rm or bdrm, used 1 summer, bought new for \$600, sell \$475/obo; COUCH, futon style, queen size, good for starting out, green cover, maple wood color, \$70/ obo; TV TABLE TRAYS, \$5 each/obo. 626/792-8272.

BABY ITEMS: carrier, Baby Bjorn, blue pin-stripe print, only a year old, exc. cond., \$50; high chair, Graco, clean, gd cond. but needs seat cushion, \$15; stroller, Century 4-in-1, vg cond., pd \$175, sell \$75; baby exer-saucer, Graco, exc. cond., \$50. 626/351-9223.

BEDROOM SET, 3 pc. king, dark wood, \$125; DINING SET, 9 pc., cane back, pecan \$600; BAR STOOLS, 2, oak, swivel, \$125/both; COMPUTER DESK, oak, 47" x 24" x 67", all exc. cond, \$175. 626/447-5353.

CLAY POTS, round, large (2-ft and 3-ft diameter), each 2" \$50/obo, each 3" \$60/obo. 626/398-3480.

COFFEE, top of the line 100% pure sun-dried Kona, hand picked from top-qual. trees, 100% rich, dark roast, ltd supply, discounted 45% at intro price of \$21/lb. 626/584-9632.

CRIB, Child Craft, converts to bed w/side dresser, 2 large drawers under bed, includes mattress, exc. condition, \$250. 957-3130.

DESK/CHAIR, antique mahogany, rolltop, \$1,500; TABLES, 2 custom rod iron indoor/outdoor, w/heavy glass top, \$2,500. 248-8853.

DRAFTING MACHINES, Bruning, model 4000, 31" arm, \$75; model 2700, 24" arm, \$55; good condition, work well. 249-1112.

FERTILITY TESTS, Clear Plan Easy fertility test sticks, brand new sealed box of 30, expires 5/2002, paid \$55, sell for \$40. 714/903-8888.

FURNITURE: oak ent. center, \$150; sofa and matching chair, \$300; sofa table, \$50; oak dining table w/6 chairs, \$150; and oak dining hutch, \$200, all in exc. condition. 248-7097.

GOLF BALLS, used, \$.25/ball or donation, money goes to pet rescue organization. 626/792-8272.

LAMPS, 3 big antique wagon wheel hubs, approx 14" tall; light comes through vertical slats for spokes; 2 are old, weathered; one is hand carved; \$50 ea. La Verne: 909/593-4046; vivdavies@starquest.net.

LAWN MOWER, reel type, 2.75 HP chain drive, front throw, \$75/obo. 626/963-1364.

MISC: sectional couch, beige, almost new, \$300; coffee table, \$75; 4 stacked tables, \$200; bar cart, \$150; child's bike, toys, etc., best offer. 248-8853.

REFRIGERATOR/FREEZER, Hotpoint model CSX20EF, side-by-side, 19.6 cu. ft., icemaker, very good cond., \$151. 957-3675.

SKI BOOTS, Salomon SX-71, men's size 11, worn only a few times, in original box, \$22/obo. 236-4869, eve.

SOFA, brown, velvet, 7 ft., good condition, \$175. 626/793-8783.

SOFA/LOVESEAT, brown, exc. cond., \$200; CHAIR, swivel, brown, exc. cond., \$75. 661/254-7443.

STAMP ALBUMS, Scotts series, U.S. commemoratives, 2 vol. binder, singles & blocks of 4; Scotts The National stamps, 25 vol., binder; Scotts '90 std. stamp catalogue, 4 vol.; Scotts Minuteman U.S. 2 vol. binder; 2 Scotts green binders, new cond.; stamp stock sheets (90) by Varrio, made in Germany, new; Scotts border blank sheets (60) for albums, new, 3 x 20; all for \$200. 249-1112.

TABLE, coffee, octagonal, beveled glass top with matching end tables, 3 pieces/\$150. 661/254-7443.

TABLE, dinette, square glass top, 5'x5' w/ metal feet and 4 matching chairs, \$800/obo; BAR STOOLS, 4 matching, metal frame, all in superb cond., \$400/obo. 626/398-3480.

TRICYCLE, girl's, fully assembled, exc. cond., w/basket, used for 2 months, \$20; EXERSAUER, \$20; ACTIVITY BOARD and table, infant/toddler, \$10; CLOTHES & SHOES, reasonably priced, designer, infant/toddler girls. 626/798-6248.

VACUUM, Hoover SteamVac Ultra, 5 brush agitator, in super condition, like new, cost \$200, sell for \$130. 362-2003, Derek.

WASHER/DRYER combo, Whirlpool Thin Twin, gas dryer, exc. condition, \$400/obo. 626/358-7055.

WASHING MACHINE, Maytag lg capacity, vg cond., \$100; AREA RUG, Pottery Barn, appr. 5 X 8 ft., ivory w/blue trim lg floral pattern, exc. cond., paid \$450, sell for \$100. 626/351-9223.

WORKBENCH with vice, \$40; LAWNMOWER, \$15; COMPUTER DESK, rosewood finish, \$50; SOFA, dark green, sm. print, vg. cond., \$50. 626/355-5662.

### Vehicles/Accessories

'92 ACURA Legend LS, 4-dr. sedan, beige/gold, auto trans., always garaged, exc. cond, 84K miles, new timing belt &brakes, all service records, Acura/Bose music system, theft deterrent, auto climate control, leather interior, moonroof, \$11,300. 236-4869, after 5 p.m.

'00 BMW 328i, automatic, power leather seats, CD, am/fm stereo, auto rain sensor, moon roof, loaded, premium pkg., 12,000 mi., a/c, like new, \$32,995. 909/599-3230.

'98 CADILLAC Sedan DeVille, orig. owner, like new, black with gold package, CD, chrome wheels, only 33K miles, priced below Bluebook, \$25,000. 248-4647.

'85 CADILLAC Coupe DeVille, runs, current

tags and smog, \$600/obo. 661/285-9159.

'72 DATSUN 240Z, w/Chevrolet 350, V8, automatic trans., roll bar, 70K, fun car, needs tuning, \$2,000/obo. 323/341-4739, jwall@oxy.edu.

'94 DODGE Stealth R/T, white, all pwr., exc. cond., 72,600 mi., \$11,000. 505/496-5101. EQUIPMENT TRAILER, Miller Tiltbed, compl. refurbished, new tires, deck, electrical, brakes, 21,000 lbs. gross vehicle weight, \$3,500/obo. 626/798-6249.

'97 FORD Escort LX, auto, air, exc. cond., 76K miles, \$5,500/obo. 626/351-9880.

'97 FORD Explorer XLT, only 27,000 miles, exc. cond., new tires, all dealer servicing, \$16,000. 626/355-5631, after 5 p.m.

'96 FORD SVT Cobra Mustang, conv., 5 speed, all black, leather interior, stereo w/CD changer, security alarm w/LoJack, clean, well-maintained, exc. cond., no modifications to body or engine, garage kept w/cover, less than 27K miles, \$21,000/obo. 626/379-1540.

'91 FORD Ranger XLT, long bed w/shell, V6, 5 spd., gd. cond., AM/FM/cass, \$3,000/obo. 626/296-9073.

'91 FORD T-Bird, V8, 32,000 original miles, interior and exterior in exc. cond., new tires and brakes, a must see and drive. 951-3467.

'95 HONDA Civic DX, red, 2 dr., 5 speed, 103,000 miles, \$10,000/obo. 362-3358.

'94 HONDA Accord EX wagon, green, 5 spd., a/c, pwr. windows, doors, sunroof, etc. VTEC engine, 76K miles, \$9,500. 626/564-1471, Babar.

'87 HONDA Civic, 2-door hatchback; '83 HONDA Accord, 2-door LX, hatchback, both running, good basic transp. 626/403-0446.

'89 MERCURY Sable, 95K miles, light blue, good cond., 3.8L, V6, power everything, \$1,800/obo. 909/902-5664.

'91 MITSUBISHI Eclipse GLX, red/black, 5 spd., turbo, AWD, am/fm/cass., prem. sound, pwr. windows/doors, new clutch, runs great, 1 owner, needs new antenna, 112K mi., \$3,000. 626/798-8065.

'95 PONTIAC Firebird, blue/green, T-tops, leather, alloy rims, all power, 135,000 miles, \$7,300. 505/496-5101.

'79 TERRY Trailer, sleeps 6, refrigerator/stove, electric/butane powered, good cond., \$1,000/obo. 626/797-6406.

'89 TOYOTA Supra, turbo, V6, 5 speed, 120K miles, new clutch/brakes, sport roof, a/c, p/s, p/w, p/dl, alarm, tilt wheel, cruise, am/fm/CD, ABS, gd. cond., \$4,400/obo. 626/449-2007.

'79 VOLVO, brick red, new tires, eng. in great shape, 198K mi., \$1,000/obo. 626/791-5376.

### Wanted

CRIB and other baby accessories. 626/462-9427, Irina or Dmitry, Irina\_Strekalova@hotmail.com.

HOST FAMILY, for a French 16 y/o male high-school student for 1 month this summer, the student likes guitar/surf/tennis, French family could host American student in exchange. Christophe Dumas at 626/564-8483 or Mrs. Colette Larre (larre@nantes.inra.fr).

HOUSING, returning graduate researcher couple, non-smokers, seek 1 bd. from end of May to end of Dec, must allow pets. 720/890-1310 or 303/492-8274, jahm@colorado.edu or jahm@mail11.jpl.nasa.gov, Moriba Jah.

TO RENT: small cottage or guest house. 1 or 2 bd., near Caltech, for a long-term Caltech staffer. 626/286-3705, Mrs. B.

### For Rent

ALTADENA, large house on private lot, new kitchen, carpet & paint, 3 bd., 2 ba., den, lg. liv. rm with f/p and formal din. rm, gardener and water paid, close to JPL, 1-yr. lease required, \$1,550. 249-8840, Garth Franklin.

ALTADENA, large room, 10 min. from JPL, private bathroom, kitchen and laundry facilities, \$475 furnished, \$425 unfurnished + utilities. 626/712-3451, Azita.

EAGLE ROCK, furn. room in single family hse, nice area, 10 min/JPL, private entrance & bath, share kitchen & laundry privileges, \$350, utilities included. 323/256-1785.

EAST PASADENA, 2-bd. house, 1-car garage, 1 carport, incl. water/trash, no smoking/pets, carpet, blinds, stove, large kitchen, gardener takes care of lawn, avail. 3/25, 1 yr. lease, \$1,200 + \$1,200 sec. dep. 714/846-6202.

GLENDALE, resident to share exclusive house & location, furnished, central courtyard w/ fountain, deck w/gazebo, bathrm w/garden vw., compl. house privileges and utilities, no smoking or drinking, 15-20 min. to JPL. 246-4750.

LA CRESCENTA, cozy 2-bd. house w/pool, private, high above Foothill, \$1,450. 952-6007. PASADENA home, 2 bd., 1 ba., 1,100 sq. feet,

on Hill Avenue with large yard, five minutes from downtown Pasadena, pets negotiable, clean credit and references required, \$1,500. 909/941-8159, Scott.

PASADENA apt., 1 bd., 1 ba., furnished close to PCC/Caltech, \$825. 626/351-9641.

PASADENA apt., 2 bd., 1.5 ba., townhome style, laundry parking, fully furnished, \$1,150. 626/351-9641.

W. TOLUCA LAKE, charming cottage for 1 or 2 people, enormous bd. w/ vaulted ceiling opens into garden; stove, ref., washer, dryer, dish-washer, disposal, enclosed garage; util. incl.; easy fwy. access; cat(s) OK; \$1,650. 980-1638, hklne2@msn.com.

### Real Estate

NORTH GLENDALE house, 4 bd., 2.5 ba., in prime Emerald Isle area, 5 mi. from JPL, attractive front view, spacious back yard, master bd. suite, formal living and dining areas, comfortable family room with wet bar, exc. cond., \$568,000. 244-3060.

SUNLAND/TUJUNGA, why pay twice the price for half the house? 15 minutes to JPL, never any smog, seldom even fog at the 1,650-foot elevation of this 3-bd., 2-ba., 2,900 sq. ft. home with loads of extras on a 10,000 sq. ft. level lot, details at <http://www.its.caltech.edu/~sharon/>, \$349,000. 352-7321.

### Vacation Rentals

BIG BEAR cabin, quiet wooded area near village, close to snow play areas, 2 bd., sleeps 8, completely furnished, f/p, TV/VCR, \$75/night. 249-8515.

BIG BEAR LAKEFRONT lux. townhome, 2 decks, tennis, pool/spa, nr. skiing, beaut. master bdrm. suite, sleeps 6. 949/786-6548.

CAMBRIA, ocean front house, sleeps up to 4, excellent view. 248-8853.

HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, priv.house and guest house comfortably sleep 6, 3 bd., 2 ba., rustic, relaxing and beautiful, swimming, snorkeling, fishing, spectacular views, near restaurants, golf courses and other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast on beach w/ocean view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, mcroww., d/w, pool, priv. lanai, slps. 4, 4/15-12/14 \$105/nt./2, 12/15-4/14 \$120/nt./2, \$10/nt. add'l person. 949/348-8047.

LAKE ARROWHEAD house, small 4 bd., 2 1/2 ba., sleeps 10, quiet, secluded, relaxing, snowy, woody area of Cedar Glen [http://www.highcountryrentals.com/cedar\\_run.html](http://www.highcountryrentals.com/cedar_run.html) for pictures/rates, JPLers who book directly with owner for 2 weekends get 1 + cleaning fees. \$370/weekend. 626/403-0446, owner.

MAMMOTH, Chamonix condo, at lifts 7, 8, 16, 17, walk to Warming Hut, 2 bd., 2 full ba., sleeps 6, fully equipd elec. kit., incl. microwave & extras, f/p and wood, color TV, VCR, cable, FM stereo, old Jacz, sauna, game, rec. & laundry rms., conv. to shops, lifts, special events, special midweek rates. 249-8524.

MAMMOTH, Courchevel, walking distance to Canyon Lodge and lifts, 2 bd., 2 ba., sleeps 6, fully equipped unit. 661/255-7958.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, sleeps 6-8, fully equipped kitchen incl. microwave, d/w, cable TV, VCR, phone, balcony w/view to mtns, jacuzzi, sauna, streams, fishponds, close to Mammoth Creek, JPL discount. 626/798-9222 or 626/794-0455.

MAMMOTH, St. Moritz #67, studio condo, great complex & price, wonderful loc. near town, on ski bus route, [www.mammothreservations.com/rooms/rooms.html](http://www.mammothreservations.com/rooms/rooms.html), or call owner direct for a JPL disc. 626/791-5376.

OCEANSIDE condo, fully furnished, 2 bd., 2 ba., fireplace, full kitchen, quiet, relaxing, located at beachside, with great ocean view, sleeps 6, 2-night minimum, available weekly or monthly. 909/981-7492, Jim or Darlene.

OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier or harbor, pool, spa, game rm., sleeps 4. 949/786-6548.

PACIFIC GROVE hse, 3 bd., 2 ba., f/p, cable TV/VCR, stereo/CD, well-eqpd. kit. w/microwv, beaut. furn, close to golf, bches, 17 Mile Dr., Aquir., Cannery Row, JPL discnt. 626/ 441-3265.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.

SAN CLEMENTE COVE timeshare, half block to beach & pier, sleeps 4, one week from April 1 or May 13, \$475. 626/836-3931.

SAN FRANCISCO, Nob Hill honeymoon suite, sleeps 2 max, full kitchen, maid service, concierge, reserve early, \$125/nite, \$750/wk. 626/254-1550.

### Editor

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### Notice to Advertisers

Advertising is available for JPL and Caltech employees, contractors and retirees and their families. No more than two ads of up to 60 words each will be published for each advertiser. Items may be combined within one submission.

Ads must be submitted on ad cards, available at the ERC and the Universe office, Bldg. 186-118, or via e-mail to [universe@jpl.nasa.gov](mailto:universe@jpl.nasa.gov).

Ads are due at 2 p.m. on the Monday after publication for the following issue.

All housing and vehicle advertisements require that the qualifying person(s) placing the ad be listed as an owner on the ownership documents.